GREENHOUSE GAS EMISSIONS REDUCTIONS BY POWERING NON-POWERED DAMS

by
Ryan Nawrocki

A capstone project submitted to Johns Hopkins University in conformity with the requirements for the degree of Master of Arts in Public Management

Baltimore, Maryland
December, 2017

Abstract

Data appears to indicate that clearly defined changes have occurred over the past century or so to the earth's climate. The National Oceanic and Atmospheric Administration (NOAA) indicates that average temperature is one of the most highly cited indicators of climate change. On average, global temperatures have risen 1.4°F since the early 20th Century. These numbers indicate that although the U.S. has withdrawn from the Paris Agreement, the U.S. should still begin work on the reduction of greenhouse gas emissions by 15% through an increased utilization of hydropower by 2050. This goal will be accomplished by powering 100 non-powered federally owned dams. The vast majority, 81 dams, are currently owned by the U.S. Army Corps of Engineers, while the remaining 19 are owned by other federal agencies. A Department of Energy (DOE) report indicated that by 2050 hydropower could reduce greenhouse gas emissions by a cumulative 5.6 gigatonnes, which is the equivalent of nearly 1.2 billion passenger vehicles driven per year. This is why the DOE suggested that the majority of hydroelectric growth by 2030 will occur by powering non-powered dams. A Public Opinion Strategies poll conducted of 2016 presidential elections voters found similar results about opinions regarding climate change and hydropower. In the survey, 61% of voters indicated that we should have more emphasis on hydropower. Dams can obstruct the natural migration of fish, change natural water temperatures, obstruct natural flows and silt loads in rivers. However, the vast majority of the federally owned dams were built mainly for flood control, municipal water supply, and irrigation water. These facilities are critically important for various reasons and not likely to be removed.

These facilities should be utilized for the additional benefit of generating clean, reliable power. This goal will be accomplished by powering 100 non-powered federally owned dams. These 100 dams have been identified as the facilities that provide the greatest potential for power generation by the DOE. These facilities can increase capacity in the short-term by 12 gigawatts or the equivalent of adding 15% capacity to the U.S. hydropower output.

Advisor: Dr. Paul Weinstein

Table of Contents

MEMORANDUM FOR SENATOR CHUCK SCHUMER

FROM: Ryan Nawrocki

SUBJECT: U.S. withdrawal from the Paris Agreement and renewable energy resources.

I. Action-Forcing Event

On June 1, 2017, President Trump announced the withdrawal of the United States from the Paris Agreement. [1] The Paris Agreement's central aim is to create a response to climate change by keeping global temperature rise this century below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. [2] Since the announcement of withdrawal from this treaty there has been strong criticism of the administration's commitment to protecting the environment. On August 4, 2017, the U.S. State Department officially informed the United Nations of the United States formal withdraw from the agreement. [3]The State Department has indicated that they are willing to continue negotiations if conditions of the treaty improve for the United States.

II. Statement of the Problem

[1] Shear, Michael, "Trump Will Withdraw U.S. From Paris Climate Agreement," *New York Times,* June 1, 2017, accessed September 5, 2017, https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html?mcubz=3

[2] "United Nations: The Paris Agreement," accessed September 5, 2017, http://unfccc.int/paris_agreement/items/9485.php

[3] Volcovici, Valerie, "U.S. submits formal notice of withdrawal from Paris climate pact," *Reuters*, August 4, 2017, accessed September 5, 2017, https://www.reuters.com/article/us-un-climate-usa-paris/u-s-submits-formal-notice-of-withdrawal-from-paris-climate-pact-idUSKBN1AK2FM

The National Academy of Science states that, "climate change is occurring, is caused largely by human activities, and poses significant risks for- and in many cases already is affecting- a broad range of human and natural systems." [4] Many scientists and environmental organizations argue that the only way to effectively manage climate change is through multilateral agreements that create a change in energy consumption or the release of carbon emissions that affect the global climate.

The complex nature of the earth's climate presents difficult scientific challenges as it involves the interaction of numerous scientific disciplines. However, data does appear to indicate that clearly defined changes have occurred over the past century or so. The National Oceanic and Atmospheric Administration (NOAA) indicates that average temperature is one of the most highly cited indicators of climate change. [5] On average, global temperatures have risen 1.4°F since the early 20th Century. [6] The increase of global temperatures has also had an impact on temperatures in the United States. Temperatures in the United States have increased in the United States on average by 0.15°F during the period of 1895-2016. [7] This average rise demonstrates that the United States is not immune to global climate factors.

In addition to average temperatures increases, climate change is also typically identified by several other factors. Sea levels have increased over the past 100 years as

[4] "National Academy of Sciences: Advancing the Science of Climate Change," (Washington, D.C.: National Academies Press, 2010), 3
[5] "NOAA: Global Climate Change Indicators," accessed September 22, 2017, https://www.ncdc.noaa.gov/monitoring-references/faq/indicators.php
[6] Ibid.

[7] Ibid.

well. On average, sea levels have increased 1.7 mm/year, which is faster than the rate averaged of the last several thousand years. [8] This global sea level rise has the potential to have significant effects in low lying areas, coastal areas, and islands. A United Nations report indicates that the costs associated with sea level rise for 52 small, island nations could cost the international economy an estimated $11.9 trillion over the next two decades. [9]

It is important, though, to differentiate between climate and weather to properly study climate change. Weather refers to, "meteorological conditions at a particular time and place."[10] Climate refers to the average and range of weather conditions over an extended period of time.[11] This is important to note because confusion can occur surrounding short-term meteorological events and long-term climate patterns that can cause confusion regarding climate change.

Climate change has the potential to impact every American citizen and every individual on the planet. Particularly this occurs through extreme weather events. Data indicates that there is an upward trend in extreme global weather events each year such as flooding, extreme storms, drought, and forest fires. [12] The United States has been directly impacted by extreme weather outcomes. In 2011 the United States experienced

---

[8] Ibid.
[9] "Sea Level Rise in Small Island Nations to Cost US$ Trillions: Shift to Green Policies and Investment Critical," accessed September 22, 2017, http://www.un.org/climatechange/blog/2014/06/sea-level-rise-in-small-island-nations-up-to-four-times-the-global-average-to-cost-us-trillions-in-annual-economic-loss-and-impede-future-development-shift-to-green-policies-and-investment-criti/.
[10] Joseph DiMento, "Climate Change: What It Means for Us, Our Children, and Our Grandchildren"(Cambridge, Massachusetts: MIT Press, 2014), 16.
[11] Ibid.
[12] Ibid.

fourteen weather disasters, and in 2012 the U.S. experienced eleven weather disasters that totaled over $1 billion in damages. [13]

Climate change does have the potential to have impacts that were unexpected. In the case of agriculture, increased temperatures could actually create higher crop yields. However, this does not mean that all farmers will benefit from higher crop yields. It is possible that suitable growing areas in the United States may shift further north, causing the southern Great Plains to become unsustainable for agriculture. [14] Regional hydraulic cycles may change as well resulting increased rainfall and precipitation in some areas, while other areas may see increased or prolonged periods of drought.

Climate change also can have a direct impact on human health. The Centers for Disease Control (CDC) reports that increased temperatures can reduce the quality of air we breathe. [15] Increased temperatures potentially expose individuals to longer pollen periods which have the direct effect of increasing allergy seasons and effects related to asthma. Increased temperatures also can result in individuals being exposed to more heat-related illnesses.[16] The young, elderly, and the sick could be especially vulnerable to health concerns such as these.

In 2015, the Department of Defense released a report indicating that climate change has national security implications. The report stated that "the Department of

[13] "Billion-Dollar Weather/Climate Disasters," accessed September 22, 2017, https://www.ncdc.noaa.gov/billions/
[14] R. Ortiz, K.D. Sayre, B. Govaerts, R. Gupta, G. V. Subbarao, T. Ban and D. Hodson, "Climate Change: Can wheat beat the heat?" *Agriculture, Ecosystem, & Environment* 126, (2008)
[15] "Climate Change Decreases the Quality of the Air We Breathe." Accessed September 22, 2017. https://www.cdc.gov/climateandhealth/pubs/air-quality-final_508.pdf
[16] Ibid.

Defense sees climate change as a present security threat." [17] National security issues exist according to the report because regional tensions could be exacerbated over resources issues such as access to water supplies among other issues.

Climate change is a multifactorial problem. The increased costs associated with extreme weather related events make this both a financial and socio-economic issue. In addition, climate changes presents problems related to human health. These problems are both direct as shown by the health concerns caused through increased temperatures and indirect as access to water and food could become problematic in some regions. Climate change is also potentially an issue of national security as stated by the 2015 Department of Defense report. Security also potentially extends to those that may live in areas that could become more likely to be subject to extreme weather events. As Superstorm Sandy demonstrated, all areas can be subject to extreme weather events. Extreme weather events have the potential to not only harm human life but can also cause significant infrastructure issues like the flooding of New York City's transportation system related to Superstorm Sandy.

These factors indicate that if this trend continues without any intervention, the United States government and economy could face increasing costs associated with climate change. Furthermore, mitigation or hardening of infrastructure could become more costly if the problem increases in severity.

[17] "National Security Implications of Climate Related Risks and a Changing Climate," accessed September 22, 2017. http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery

III. History/Background

In 1896 Swedish chemist Svante Arrhenius described what he called the greenhouse problem where he related a rise in concentrations of atmospheric carbon dioxide caused by burning coal as an energy source to warming of the planet. [18] At the time Arrhenius viewed warming related to increased carbon emissions as beneficial rather than problematic. However, there was not much significant discussion in the issue of global warming or climate change until 1950s. From the 1950s through the 1980s there was growing discussion about ecological issues related to climate change and a growing consensus that climate change as caused at least to some degree by anthropomorphic events. However, there was not a broad consensus that global action should be taken until the early 1990s. In 1992, the United States participated in the United Nations Framework Convention on Climate Change. However, broad action on this meeting was not taken until 1997 when 10,000 international delegates met in Kyoto, Japan to produce an agreement that called on industrialized countries to reduce greenhouse gas emissions between the 2008-2012 commitment period to 5 percent below 1990 levels. [19]Prior to the Kyoto Protocol in 1997, a great deal of international policy regarding climate change was focused on research and voluntary emissions

[18] Michael Oppenheimer and Jesse K. Anttila-Hughes, "The Science of Climate Change," *Future of Children* 26, no. 1 (2016) : 12

[19] Joseph DiMento, "Climate Change: What It Means for Us, Our Children, and Our Grandchildren"(Cambridge, Massachusetts: MIT Press, 2014), 16.

reductions. For instance, in 1979 the First World Climate Conference called for greater cooperation to study climate change to prevent it from getting worse. [20]

Domestically, policy action has been through a combination of federal, state, and local initiatives. In 2001, the United States withdrew from the Kyoto Protocol. Although surprising to some at the time this seemed like an inevitable outcome. For instance, in 1997 the U.S. Senate had passed the Byrd-Hagel resolution by a vote of 95-0 for a global agreement instead of an agreement that only affected industrialized nations. [21] The U.S. signed the Kyoto Protocol in 1998 but did not send it to the U.S. Senate for ratification. This meant that although the agreement would be enforced while President Clinton was in office, it did not carry the full weight of a U.S. law meaning that a successor in office could easily remove the United States from that agreement.

In 2001, President George W. Bush removed the U.S. from the Kyoto Protocol, saying "it exempts 80 percent of the world, including major population centers such as China and India, from compliance, and would cause serious harm to the U.S. economy."[22] At the time a majority of Americans disagreed with President Bush's decision to withdraw from the Kyoto Protocol. According to an ABC News survey, 61

[20] John W. Zillman, "A history of climate activities" WMO Bulletin no. 58 (2009).
[21] Joseph DiMento, "Climate Change: What It Means for Us, Our Children, and Our Grandchildren"(Cambridge, Massachusetts: MIT Press, 2014), 16.
[22] White House, "Letter from President George W. Bush to Senators Hagel, Helms, Craig, and Roberts" *White House*, accessed October 4, 2017, https://georgewbush-whitehouse.archives.gov/news/releases/2001/03/20010314.html

percent of Americans disagreed with the decision to withdraw from the Kyoto Protocol. [23]

Instead of adopting a system that would reduce total greenhouse gas emissions, the Bush Administration adopted the Global Climate Change Initiative. This initiative aimed at reducing greenhouse gas emissions to economic output by 18 percent by 2012 through domestic voluntary action and research. [24] The U.S position has been to focus on research to help mitigate climate change. For instance, the 2015 budget specifically said that the focuses of climate change were on prediction, mitigation and adaptation to global climate change. [25]

There has been some congressional action on climate change that was initiated outside of executive action. In 2005, the United States Senate passed a resolution stating its intention to require a future date a program of mandatory limits and incentives to greenhouse gas emissions. [26] This was significant because it started a movement of federal action on climate change that occurred both in the legislative, executive, and judicial branches. In 2007, Congress passed the Energy Independence

[23] ABCNews.com, "Opinion Poll," ABC News, accessed October 4, 2017, http://pollingreport.com/enviro3.htm

[24] Joseph DiMento, "Climate Change: What It Means for Us, Our Children, and Our Grandchildren"(Cambridge, Massachusetts: MIT Press, 2014).

[25] John P. Holdren, "Statement of Dr. John P. Holdren Director Office of Science and Technology Policy Executive Office of the President of the United States to the Committee on Budget United States Senate," accessed October 4, 2017 https://www.budget.senate.gov/imo/media/doc/OSTP%20Senate%20Budget%20STEM%20testimony%200513%20FINAL.pdf

[26] U.S. Senate, "Energy Policy Act of 2005,"accessed October 4, 2017, https://www.govtrack.us/congress/votes/109-2005/s158

and Security Act. [27] This law encouraged the carbon capture, sequestration, and store techniques. It also called for greater energy performance from the federal government, increased the production of renewable fuels, and called for improved vehicle fuel economy. [28] Perhaps most significant with this legislation was that it enjoyed bipartisan support being passed by a democratically controlled congress and receiving President Bush's signature.

In 2007, the Supreme Court ruled in *Massachusetts v. EPA* that the EPA had overstepped its discretion in its failure to regulate greenhouse gas emissions under the Clean Air Act. [29] Although this decision was significant because it established that greenhouse gas emissions could be regulated under the Clean Air Act, it did not make a finding as to whether greenhouse gases endanger public health or welfare. [30] This was still a significant step toward having a larger federal role in the regulation of greenhouse gases.

By 2009, President Obama had been sworn in to office and there was unified democratic control of both the House and Senate. This allowed for some significant pieces of climate change legislation to move forward. The Omnibus Appropriations Act of 2009 that passed included language mandating that the EPA develop a greenhouse

[27] Environmental Protection Agency, "Summary of the Energy Independence and Security Act," *EPA*, accessed October 4, 2017 https://www.epa.gov/laws-regulations/summary-energy-independence-and-security-act
[28] Ibid.
[29] U.S. Department of Justice, "Massachusetts v. EPA," *Department of Justice*, accessed October 4, 2017 https://www.justice.gov/enrd/massachusetts-v-epa
[30] Ibid.

gas emissions reporting rule. [31] This rule requires about 85 percent of greenhouse gas emitters in the United States to report their emissions. [32] Also in 2009, President Obama created the Interagency Climate Change Adaptation Task. [33] The task forces specific mission was to recommend ways that federal policies and programs can better prepare the U.S. for climate change.

While significant climate change initiatives were moving through the federal government during this time period there were measures that did not pass through congress. Most notably, the House passed the American Clean Energy and Security Act. The act would have required establishing a national cap-and-trade system for greenhouse gas emissions and would have reduced emission levels to 83 percent of 2005 levels by 2020. [34] Ultimately, this legislation was unable to move through the Senate.

In 2013, the National Institutes of Health investigated the impacts of climate change on human health. [35] This was significant because it began to examine climate change from a health perspective. At this time NIH identified nearly 800 projects focusing on climate change and its effects.[36] Prior to this, most conversation regarding

---

[31] EPA, "Greenhouse Gas Reporting Program," Environmental Protection Agency, accessed October 4, 2017 https://www.epa.gov/ghgreporting/history-proposed-rules

[32] Ibid.
[33] Obama White House, "Climate Change Resilience," Obama White House Archives, accessed October 4, 2017, https://obamawhitehouse.archives.gov/administration/eop/ceq/initiatives/resilience
[34] Congress.gov, "American Clean Energy and Security Act of 2009," Congress.gov, accessed October 4, 2017, https://www.congress.gov/bill/111th-congress/house-bill/2454
[35] National Institutes of Health, "Climate and Human Health," NIH, accessed October 4, 2017, https://www.niehs.nih.gov/research/programs/geh/climatechange/
[36] Ibid.

climate change centered around the scientific, environmental, or energy fields and not necessarily the human health perspective.

During the Obama presidency, the EPA undertook a more significant role than in years past of regulating greenhouse gas emissions. In 2010, the EPA and the National Highway Traffic Safety Administration produced the first ever rule limiting greenhouse gas emissions from light trucks and cars. [37] This represented the first time that fuel efficiency standards and tailpipe emissions were regulated together. In 2011, the EPA and the National Highway Traffic Safety Administration adopted similar rules to regulate emissions from medium to heavy duty vehicles. [38] Interestingly, during this time this time the federal government granted a waiver to California to these rules because California created more strict standards.

While much of the debate at the national level appears to be somewhat along partisan lines, it has not been exclusively a partisan issue. The Clinton Administration, for instance, walked away from a proposal by Vice President Gore to tax the use of fossil fuels. [39] However, the debate about climate change and how to deal with it has not only been at the federal level. U.S. states and cities have also taken a varied approach to climate change. The view of climate change is broad among the states, one thing that

[37] Joseph DiMento, "Climate Change: What It Means for Us, Our Children, and Our Grandchildren"(Cambridge, Massachusetts: MIT Press, 2014).
[38] Ibid.
[39] Barry Rabe, "Greenhouse and statehouse: The evolving state government role in climate change," (Washington, D.C.: Pew Center on Global Climate Change, 2002).

illustrates this was the states position on the Kyoto Protocol. At least sixteen states passed resolutions asking the federal government to reject the Kyoto Protocol. [40]

Several New England governors and eastern Canadian premiers developed a regional plan to address climate change called the Climate Change Action Plan in 2001. [41] This group agreed to reduce greenhouse gas emissions to 1990 levels by 2010 and at least ten percent below 1990 levels by 2020. [42] In addition to these states, it is worth noting that nearly half of the U.S. states have had statewide emissions goals and plans at reducing greenhouse gas emissions. [43]

In many places the use of coal to generate electricity has declined. This has occurred because of the relatively recent discovery of large amounts of natural gas within the U.S. because of the new natural gas extraction technique commonly referred to as hydro fracturing. Initially, this was thought to have a beneficial impact on climate change because natural gas is lower in carbon dioxide than coal. However, natural gas has large amounts of methane, which is a more powerful greenhouse gas than carbon dioxide. [44]

Certain states such as California and New York have been quite active in the policy making process with respect to climate change. California has stricter vehicle

---

[40] Ibid.
[41] Conference of New England Governors and Eastern Canadian Premiers, "Climate Change Action Plan," accessed October 4, 2017 https://www.des.nh.gov/organization/divisions/air/tsb/tps/climate/neg_ecp_plan.htm
[42] Ibid.
[43] Center for Climate and Energy Solutions, "Climate Change 101: State Action," accessed October 4 2017, https://www.c2es.org/docUploads/climate101-state.pdf
[44] Joseph DiMento, "Climate Change: What It Means for Us, Our Children, and Our Grandchildren"(Cambridge, Massachusetts: MIT Press, 2014).

emissions standards than the U.S. government does for instance. However, not all action has occurred within government. There are others in the private sector that have focused on climate change as well. New York's Consolidated Edison power company reported lower greenhouse gas emissions level in 2011 than in 2005. [45]

In 2015 the United States agreed to participate in the Paris Agreement. The agreement met a long standing concern of the U.S. that all countries participate, regardless of economic developmental status. [46] The plan calls for a limit on global warming to be at 1.5 degrees Celsius relative to the pre-industrial baseline. [47] The plan allowed for flexibility of each nation to develop their own approach of meeting goals. In addition, it provided for a mechanism for countries to help developing nations financially to meet their specific goals.

In June 2017, President Trump announced that they United States would be leaving the Paris Agreement. [48] The Administration's position has been that they want to renegotiate the treaty on terms more favorable to the U.S. Chief among the concerns was that the international community and international law would have too great an impact on U.S. domestic affairs. [49] The U.S. is now looking to renegotiate this treaty with other major players and did already reach out to countries such as Britain, France, and

[45] ConEdison, "2011 Sustainability report: Reducing greenhouse gases," accessed October 4, 2017, https://www.conedison.com/ehs/2011annualreport/introduction/sustainability-strategy.html
[46] David Hone, "Putting the Genie Back: Solving the Climate and Energy Dilemma," (United Kindgom: Emerald Publishing Limited, 2017).
[47] Ibid.
[48] Shear, Michael, "Trump Will Withdraw U.S. From Paris Climate Agreement," New York Times, June 1, 2017, accessed September 5, 2017, https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html?mcubz=3
[49] Ibid.

Germany. As of this point negotiations and decisions are still pending with respect to the future of the agreement. The United States currently has a great deal of existing infrastructure that could be utilized to generate hydropower.

Currently, the largest source of greenhouse gas emissions in the United States is from human activities in the form of burning fossil fuels for electricity, heat, and transportation. [50] Chief among the areas of greenhouse gas emissions is electricity production. Electricity production accounted for 29 percent of the U.S.' greenhouse gas emissions in 2015.[51] In 2015, 67 percent of the U.S. electricity production occurred through the burning of fossil fuels. [52] The major goal of the Paris Agreement is to reduce climate change from greenhouse gas emissions.

There are 80,000 non-powered dams compared to only 2,500 powered dams in the United States.[53] These dams offer the most simple and cost-effective way to increase hydropower production. A recent study by the U.S. Department of Energy indicates that adding energy to non-powered dams has the potential to increase capacity in the short-term by 12 gigawatts or the equivalent of adding 15% capacity to the U.S. hydropower output.[54] This same research shows that a majority of potential is

[50] Environmental Protection Agency, "Sources of Greenhouse Gas Emissions," accessed October 20, 2017 https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions.
[51] Ibid.
[52] Ibid.
[53] U.S. Department of Energy, "An Assesment of Energy Potential at Non-Powered Dams in the United States," April 2012, accessed October 20, 2017, https://energy.gov/sites/prod/files/2013/12/f5/npd_report_0.pdf
[54] Ibid.

concentrated in 100 non-powered dams, and 81 of these facilities are owned by the U.S. Army Corps of Engineers.[55]

In 2013, the Hydropower Regulatory Efficiency Act was passed which directed FERC to explore a 2-year licensing process for powering existing non-powered dams. [56] This creates the legal framework to expand utilization of non-powered dams. Dating back to 1902 with the passage of the Reclamation Act, the U.S. Federal Government has had an active role in both the regulation and construction of hydropower facilities. This long period of involvement in the process establishes a clear legal and constitutional basis for further involvement in power generation. Since 1920 with the passage of the Federal Water Power Act, the U.S. Federal Government has taken an active role in producing electricity at federal dam projects. This role was further expanded with the passage of pieces of legislation such as the TVA Act which created the TVA to among other things generate electricity in the Tennessee Valley.[57]

IV. Policy Proposal

Although the U.S. has withdrawn from the Paris Agreement, the U.S. should still begin work on the reduction of greenhouse gas emissions by 15% through an increased utilization of hydropower by 2050. This goal will be accomplished by powering 100 non-powered federally owned dams. The vast majority, 81 dams, are currently owned by the

[55] Ibid.
[56] U.S. Department of Energy, "Hydropower Vision: New Report Highlights Future Pathways for U.S. Hydropower," accessed October 20, 2017 https://energy.gov/articles/hydropower-vision-new-report-highlights-future-pathways-us-hydropower.
[57] Ibid.

U.S. Army Corps of Engineers, while the remaining 19 are owned by other federal agencies.

Policy Authorization Tool

The policy authorization tool will be legislation. The piece of legislation should be titled the Hydropower Regulatory Efficiency Act of 2017. This law will be a modified version of the Hydropower Regulatory Efficiency Act of 2013. The legislation will allow for a reduction of regulatory burden on the 100 federally owned hydropower facility to allow for more immediate power generation. In particular, the law would decrease the licensing time period on these federally owned facilities from the two year period prescribed in the 2013 law to one year in the 2017 act. In addition, the law will give these facilities greater flexibility in developing ways to comply with regulations regarding fish stocks and migratory species in the waterways. This is the case because these facilities are already existing, meaning they are not placing new pressures on fish or other species in the waterways like a new dam would. Specifically, the laws modification will allow for these facilities to develop methods of fish passage, but should not require these facilities to meet new dam standards of fish passage, since they are already preexisting structures. This law will include an authorization for funding that will require an annual appropriation by Congress.

Once this legislation is passed, there will be a second authorization tool necessary to implement this new law. In this case, it will be new FERC regulations describing how this law would be implemented. Since FERC already has primary

responsibility for regulating electric generation facilities, this would not require additional passage of legislation to accommodate the new regulations FERC would create for these 100 facilities.

Policy Implementation Tool

The bill would allow for "grandfathering" these federal facilities under existing regulations with respect to fish passage regulations. An additional feature within the law to create buy in for electric generation within the communities these dams exist would be language in the law that allows for reduced electric rates for communities around these facilities. Although no concrete numbers exist for the cost to fund the retrofit of all 100 facilities one recent retrofit of five non-powered dams in Ohio was estimated to cost a total $1.9 billion. [58] Therefore the bill would provide $2 billion in funding to begin work on the first five non-powered dams.

To ensure appropriate action occurs, this legislation will create a time period in which action must occur on the energy generation at non-powered dams. Action in this case would not be described as completion of all of the projects, but a plan in place. Within two years, the U.S. Army Corps of Engineers should have a plan in place to power all of their facilities. The Corps would be subject to a loss of funding of 15 percent of their budget for two years if a plan is not in place. In this case, 15 percent represents a

[58] Kate Galbraith, "Retrofitting Dams to Generate Electricity," Washington Post, August 19, 2009, accessed October 20, 2017, https://green.blogs.nytimes.com/2009/08/19/retrofitting-non-electctric-dams-for-power/.

significant amount of funding and underscores the significant impact a 15 percent reduction of greenhouse gas emissions would have.

Finally, the implementation will require education campaigns in affected communities. The law should authorize funds for a significant public outreach campaign regarding powering these dams. Public outreach will generate feedback and offer opportunities for conversation to occur about the benefit of powering these dams. In addition, public outreach will likely generate legislative support.

V. Policy Analysis

Hydropower represents a significant opportunity to improve the current release of greenhouse gas emissions in the United States. Currently, hydropower provides only about seven percent of the nation's energy supply. [59] However, it offers a clean and reliable source of energy production that could significantly reduce the dependence on fossil fuels to generate electricity. The hydropower industry currently supports 143,000 jobs in the United States, so expansion of this industry also offers opportunities for economic growth as well. [60]

A Department of Energy report indicated that by 2050 hydropower could reduce greenhouse gas emissions by a cumulative 5.6 gigatonnes, which is the equivalent of nearly 1.2 billion passenger vehicles driven per year.[61] There is also a beneficial effect on

[59] U.S. Department of Energy, "Hydropower Vision: New Report Highlights Future Pathways for U.S. Hydropower," accessed October 20, 2017 https://energy.gov/articles/hydropower-vision-new-report-highlights-future-pathways-us-hydropower.
[60] Ibid.
[61] Ibid.

human health and the economy through reduced greenhouse gas emissions related to increased hydropower utilization. By 2050, increased hydropower utilization could also save an estimated $58 billion from avoided healthcare costs and economic damages. [62]

Hydropower could effectively reduce greenhouse gas emissions as it has already demonstrated its strong potential as a renewable energy source. In 2014 hydroelectric facilities were the largest renewable power source in the U.S. [63] Hydropower production, though, is not evenly divided throughout the U.S. Hydropower production is generally greater in the West, which can produce issues with capacity or storage. [64]

Several concerns exist when considering hydropower. Recent droughts in the West highlight what can happen if water levels are not as high. In 2014 hydropower contributed about 10 percent of power to California's energy portfolio. [65] This number represented half of the 20 percent that hydropower usually comprises of California's energy portfolio. [66]A similar pattern was also replicated at the Hoover Dam, which was also producing significantly less power than normal.[67]Generally, reductions in hydropower generation require a different resource to fill the void created by a lack of

---

[62] Ibid.
[63] U.S. Energy Information Administration, Electric Power Monthly, March 2015, http://www.eia.gov/electricity/
monthly/pdf/epm.pdf
[64] Ibid.
[65] Michelle Bowman," California drought leads to less hydropower, increased natural gas generation", Energy
Information Administration, Washington, DC, October 6, 2014, http://www.eia.gov/todayinenergy/detail.cfm?id=
18271
[66] Ibid.
[67] Mary Ann Capehart, "Drought Diminishes Hydropower Capacity in Western U.S.", Water Resources Research Center,
Tucson, AZ, January 2015, https://wrrc.arizona.edu/drought-diminishes-hydropower

hydropower generation. In recent years, shortages in hydropower generation have been filled by utilizing increased amounts of natural gas power generation, which produces more greenhouse gas emissions. [68]

An additional concern regarding hydropower is whether the source is actually a renewable resource. Recently, a debate has occurred which suggests that hydropower is not a renewable resource because of the effects large scale projects can have on ecosystems, greenhouse gas emissions that occur during the construction of facilities and evaporation that can occur in reservoirs in arid areas. However, utilizing existing facilities reduces these concerns since new construction is much more minimal and environmental impacts already exist therefore power generation is not likely to significantly alter the environment.

Infrastructure is another concern related to utilizing federally owned dams. Hydropower generating facilities have a nominal life expectancy of 50 years. In 2014, the average age of Army Corps hydropower facilities was 49 years. [69] There have been concerns raised based upon the age of these facilities with regard to reliability. As facilities age, there are more frequent needs for repairs and down time that results in less energy delivery. According to the Corps, many of their facilities have fallen below

[68] Peter H Gleick, Impacts of California's Ongoing
Drought: Hydroelectricity Generation, Pacific Institute, Oakland, CA, March 17, 2015,
http://pacinst.org/wp-content/
uploads/sites/21/2015/03/California-Drought-and-Energy-Final1.pdf.
[69] Kamau Sadiki," US Army Corps of Engineers Hydropower Infrastructure:
Challenges and Opportunities, U.S. Army Corps of Engineers", October 30, 2013, http://www.cg-la.com/documents/
NALF5/presentations/10.30.13/2ColonialRoom/1ElectricityGenerationTransmission/6USACE.pdf.

the industry goal of 95 percent unit availability. [70] Although there has not been a comprehensive study of the age of the Corps facilities that are currently non-powered dams, it is possible that some of these facilities could be older structures, which could reduce the productivity of the facility.

Hydropower, overall, has been a generally reliable and efficient source of energy in U.S. In 2015, there were 2,198 active hydropower plants within the United States. [71] Hydropower production is also geographically diverse with 48 states having active hydropower facilities within their borders. [72] While this potential is spread out throughout the U.S., the potential for the 100 non-powered federally owned facilities is much more concentrated within a few key areas. The top ten facilities for power potential are Army Corps navigation locks on the Ohio River, Mississippi River, Alabama River, and Arkansas River. [73] The lack of geographic diversity could be beneficial as construction and environmental mitigation concerns may be similar at these facilities since they are located in similar areas. However, this does limit the ability to spread hydropower options throughout the U.S.

Unlike some other forms of renewable energy, hydropower has the ability to store energy capacity. This can be accomplished either through several different methods. A storage plant uses a dam to store enough water in a reservoir, so that when

[70] Ibid.
[71] U.S. Department of Energy, "Hydropower Vision: New Report Highlights Future Pathways for U.S. Hydropower," accessed October 20, 2017 https://energy.gov/articles/hydropower-vision-new-report-highlights-future-pathways-us-hydropower.
[72] Ibid.
[73] U.S. Department of Energy, "An Assesment of Energy Potential at Non-Powered Dams in the United States," April 2012, accessed October 20, 2017, https://energy.gov/sites/prod/files/2013/12/f5/npd_report_0.pdf

the water is released it spins the turbine which immediately generates electricity. [74] This storage capacity creates a unique benefit to hydropower that also increases the efficiency of this form of energy. This creates an ability to overcome some levels of drought for hydropower, even if river flows are low.

A Department of Energy study found that the costs associated with powering non-powered dams are significantly lower than construction of new dam projects. On average the cost per kilowatt hour for a non-powered dam ranges from $2,750 to $9,000. [75] By comparison, the cost per kilowatt hour for a new facility ranges from $5,200 to $15,600. [76] This is a significant difference and why the Department of Energy suggested that the majority of hydroelectric growth by 2030 will occur by powering non-powered dams.[77]

The U.S. power sector is the largest withdrawer of water in the nation. [78] A withdraw is characterized as water removed or diverted from a water source for use. [79] However, the benefit of utilizing existing facilities is that there is no net increase in water withdrawals.

[74] M. J. Sale, U.S. Army Corps of Engineers, Institute for Water Resources, "Outlook for the U.S. Army Corps of
Engineers Hydropower Program", 2011-WRO-P-02, Washington, DC, March 2011.
[75] U.S. Department of Energy, "Hydropower Vision: New Report Highlights Future Pathways for U.S. Hydropower," accessed October 20, 2017 https://energy.gov/articles/hydropower-vision-new-report-highlights-future-pathways-us-hydropower.
[76] Ibid.
[77] Ibid.
[78] Ibid.
[79] Ibid.

Identifying the total cost of powering these facilities is difficult. Currently, there has been no comprehensive study completed to access the total cost of powering all 100 federal dams. While there is no concrete cost for construction of these facilities, some argue that there are hidden costs associated with hydroelectric facilities that should be considered. One particular environmental cost associated with hydroelectric facilities is associated with fish stocks. During the initial approach to a dam, water pressure increases due to deeper waters in the reservoir behind the dam. [80] Fish then enter where there is a rapid decompression and water surge as they pass through the dam. This rapid moving water can cause fish to strike the walls of the tube resulting in injury. [81] In addition, fish can be injured from the rapid change in water pressure. This is called barometric trauma, where internal organs and eyes can be pulled out in this process killing the fish.[82] After fish pass through the dam, there are often turbulent waters where they reenter the river which can result in shear stresses that rips off scales and fins.[83]

However, some concerns related to fish passage are minimized at certain Army Corps facilities because they are navigation locks. This means that these facilities can already open to allow boats to navigate through them. It is possible these locks could also be utilized to allow for fish passage. Although all facilities are not locks. This means that issues of fish passage should be considered. However, since they are already

[80] James Conca, "The Hidden Cost of Hydroelectric Power," *Forbes*, Nov. 4, 2014.
[81] Ibid.
[82] Ibid.
[83] Ibid.

existing dams many of these facilities already had to consider concerns regarding fish passage.

A recent Department of Energy project in conjunction with Voith Hydro and Alden has resulted in the development of a much more fish friendly hydroelectric turbine. The turbines rotate at a slower speed and the turbines only utilize three blades, which significantly decreases fish mortality related to the turbines.[84] Fish survival rates from this new turbine are expecting to be 98 percent depending upon the species.[85] Utilizing these new technologies with fish ladders, which allow migratory species to travel up river, can greatly reduce the impact dams have on fish stocks.

Dams offer positive environmental benefits. The Conowingo Dam in Maryland provides an example of the positive benefits dams can create. The dam is a hydroelectric facility that was created in 1928. Since its creation the dam has trapped nearly 200 million tons of sediment behind the dam that would have otherwise gone into the Chesapeake Bay. [86] Utilizing non-powered dams could allow these facilities to stay in place and allow them to continue to trap sediment that may flow downstream or in other larger bodies of water.

The trapped sediment behind dams, though, is something to consider during the construction of powering non-powered dams. It is worth noting that construction at

---

[84] Thomas Overton. "Hydropower Innovations Make Some Noise." Power 159, no. 10 (October 2015): 60-62.
[85] Ibid.
[86] Pamela Wood, "Hogan plans test dredging of sediment at the Conowingo Dam," The Baltimore Sun, Aug. 8, 2017, accessed November 10, 2017, http://www.baltimoresun.com/news/maryland/environment/bs-md-hogan-conowingo-20170808-story.html

facilities that are trapping large amount of sediment could cause a scour event. Scour events are where large amounts of sediment are released in to a waterway. Typically, these events are caused from a large storm like a hurricane or tropical storm, but disturbing the sediment could cause an issue like this.

Ultimately, the largest concern with powering non-powered dams is the current regulatory environment. A recent Department of Energy report indicated that, "stakeholders have expressed concerns that regulatory process inefficiencies, overlaps, and interpretations can lead to delays and costs that result in long-term business risks." [87] In addition to regulatory concerns with inefficiencies there are concerns regarding what spaces could be utilized that would contribute to the already existing inefficiency. The same DOE report indicated powering existing non-powered dams and water conveyances such as canals could be cost effectively leveraged for electric facilities. [88]

Powering non-powered dams and canals more quickly could result in significant financial benefits to the U.S. The Department of Energy reports that powering these facilities could result in $209 billion saved in damages from greenhouse gas emissions between 2017 and 2050. [89] In addition, these facilities could contribute to 30 trillion gallons of water being saved to benefit the environment. [90] These efficiencies represent significant gains from allowing facilities to be powered more quickly.

---

[87] U.S. Department of Energy, "Hydropower Vision: New Report Highlights Future Pathways for U.S. Hydropower," accessed October 20, 2017 https://energy.gov/articles/hydropower-vision-new-report-highlights-future-pathways-us-hydropower.
[88] Ibid.
[89] Ibid.
[90] Ibid.

VI. Political Analysis

There are several key stakeholders with respect to hydropower issues. On the House side any legislation must first pass through the House Committee on Natural Resources. There are several individuals of importance. First, Chairman Rob Bishop has been supportive of expanding hydropower generation at existing federal facilities. On June 27, 2017 the House passed the Bureau of Reclamation Pumped Storage Hydropower Development Act. [91] This bill allows for power generation to occur at Bureau of Reclamation facilities and places the Bureau of Reclamation as the lead in charge of these projects. [92] This legislation was supported by Chairman Bishop who stated, "For an 'all-of-the-above' energy strategy we need 'all-of-the-above' energy infrastructure. This bill bolsters a diverse and strong domestic power supply through the expansion of pumped water storage, providing greater certainty to hydropower markets and more affordable energy to the American consumer."[93] In addition to Mr. Bishop's support this bill also was sponsored by Rep. Doug Lamborn who is the subcommittee chair on the Natural Resources Committee's Water, Power and Oceans Subcommittee, which has jurisdiction over federal hydropower projects. Rep. Lamborn said, "the Bureau of Reclamation Pumped Storage Hydropower Development Act looks to pave the way for additional clean hydropower generation by clearing up regulatory

[91] House Committee on Natural Resources, "Pumped Storage Integral to All of the Above Energy Approach," June 27, 2017, accessed November 22, 2017 https://naturalresources.house.gov/newsroom/documentsingle.aspx?DocumentID=402316
[92] Ibid.
[93] Ibid.

permitting confusion at existing Bureau of Reclamation facilities."[94] Support from Reps. Bishop and Lamborn would be critical to moving any hydropower legislation through the House. It appears based upon their positions on this bill that they are supportive of increased power generation at federal facilities.

In addition to Natural Resources support, there was key leadership support for this bill that would expand utilization of hydropower federal lands. In particular of note was that Rep. Cathy McMorris Rodgers was a co-sponsor of this legislation. [95] Rep. McMorris Rodgers is the Chair of the House Republican Conference, which is the fourth highest position in the House. Yet another key indicator of the potential interest in increased hydropower was the fact that this piece of legislation passed by voice vote. [96] Bills passed by voice vote are typically noncontroversial and do not have an objection from either side.

The Senate has also introduced legislation recently, which shows a willingness to increase the utilization of hydropower. In particular, Senators Lisa Murkowski and Maria Cantwell, the Chairman and ranking member of the Energy and Natural Resources Committee introduced legislation to expand the utilization of hydropower. The Energy and Natural Resources Act of 2017 would ensure efficiency on receiving hydropower licenses and reduce delays in issuing new licenses. [97] Senator Murkowski has often also

---

[94] Ibid.
[95] Congress.gov, "H.R.1967 - Bureau of Reclamation Pumped Storage Hydropower Development Act," accessed November 22, 2017 https://www.congress.gov/bill/115th-congress/house-bill/1967/cosponsors
[96] Ibid.
[97] Energy and Natural Resources Committee, "Senators Murkowski and Cantwell Introduce Broad, Bipartisan Energy and Natural Resources Bill," June 29, 2017, accessed November 22, 2017 Senators Murkowski and Cantwell Introduce Broad, Bipartisan Energy and Natural Resources Bill

been a key deciding vote on many issues in the Senate, so her support on expanding hydropower is crucial to moving legislation through the Senate. In fact, Senator Murkowski has said, "We need to make the relicensing process more efficient by reducing bureaucratic and administrative delays that end up increasing electricity rates, slowing hydropower's expansion, and actually delaying the adoption of environmental mitigation measures."[98]

In addition to Senators Murkowski and Cantwell, other key Senators have indicated their support for increased hydropower. In particular your New York Senate colleague, Senator Gillibrand, has indicated her support for increased utilization of hydropower through several bills and amendments. Senator Gillibrand indicated a desire to increase hydropower in New York to, "help home-grown businesses in our region including hydropower." [99] Support of your New York colleague for additional hydropower provides key local political support for an expansion of the technology.

While there seems to be support in both the Senate and House for additional hydropower, it is less clear where the President will be on this issue. There has yet to be any significant action with regard to hydropower by the administration. However, there have been comments which indicate support for hydropower and making the licensing process less difficult. Recently, President Trump said, "hydropower is a great, great form

[98] Murkowski.Senate.Gov, "Sen. Murkowski Promotes Use of Hydropower as Senate Considers Bipartisan Energy Bill," February 16, 2016, accessed November 22, 2017, https://www.murkowski.senate.gov/press/release/sen-murkowski-promotes-use-of-hydropower-as-senate-considers-bipartisan-energy-bill

[99] Saratoga.com "Ten Questions with Congresswoman Gillibrand," accessed November 22, 2017, https://www.saratoga.com/news-archive/interviews/gillibrand/

of power…But we don't even talk about it anymore because the permits are virtually impossible."[100] This statement seems to indicate that the President would be supportive of legislation that removes barriers to increased levels of hydropower production.

The primary arguments against hydropower are environmental. Impoundment and pumped storage facilities can cause serious environmental harm to surrounding areas. They can alter the amount and quality of water flowing downstream, which affects plant life as well as both aquatic and land-based animal species. Turbines kill fish in the river, although this impact can be mitigated through the use of fish ladders and similar structures. Dams block migratory routes, particularly for such as salmon that live in the ocean but come up rivers to spawn. The creation of new dams can destroy the habitat of species, including forests. The destruction of forests produces methane, a potent greenhouse gas. Dams also reduce sediment and nutriment flow downstream and reduce the temperature of the water.

All of these environmental concerns have caused some major environmental groups to voice opposition to hydroelectric projects. For instance, the Water Keeper Alliance described recent hydroelectric projects as, "guided by the false premise that they produce clean energy, even as study after study refutes this claim." [101] Another group that has repeated concerns regarding the beneficial nature of hydropower is the Hydropower Reform Coalition. This organization is comprised of 160 national, regional,

[100] Michael Harris, "Trump: Hydro a "great, great form of power," April 4, 2017, accessed November 22, 2017 http://www.hydroworld.com/articles/2017/04/trump-hydro-a-great-great-form-of-power.html
[101] Gary Wockner, "The False Promise of Hydropower," Water Keeper Alliance, accessed November 22, 2017, http://waterkeeper.org/magazine/summer-2015-3/the-false-promise-of-hydropower/

and local organizations that are particularly concerned with hydropower's environmental impact.[102] In particular this organization touts their successes of having existing dams removed and would likely be opposed to adding additional hydropower capacity at federal facilities. [103]

The public appears to believe that both climate change is occurring and that there should be a greater investment in renewable energy sources in the U.S. A study of 2016 presidential election voters conducted by Yale University indicated that 82% of democrats and 50% of republicans believe global warming is occurring.[104] In addition, this same survey found large majorities of both parties believe that we should fund research for renewable energy sources. [105]

A Public Opinion Strategies poll conducted of 2016 presidential elections voters found similar results about opinions regarding climate change and hydropower. In the survey, 61% of voters indicated that we should have more emphasis on hydropower. [106] Even 56% of Trump voters want to see more emphasis placed on the development of hydropower. [107] This number appear to indicate a strong, bipartisan support for increased utilization of hydropower.

---

[102] Hydropower Reform Coalition," About The Hydropower Reform Coalition," accessed November 22, 2017 http://www.hydroreform.org/about
[103] Ibid.
[104] Yale Program on Climate Change, "Partisan Climate Opinion Maps 2016," accessed November 22, 2017 http://climatecommunication.yale.edu/visualizations-data/partisan-maps-2016/?est=happening&group=rep&type=value&geo=cd
[105] Ibid.
[106] Public Opinion Strategies, "Post-Election National Clean Energy Survey," November 10-13, 2016, accessed November 22, 2017, http://www.conservativeenergynetwork.org/wp-content/uploads/2016/11/Clean-Energy-Survey4.pdf
[107] Ibid.

The political benefits associated with this decision are reduced levels of greenhouse gas emissions needed to generate energy. This benefit, as the polling demonstrates, plays well both with democrats and republicans. This bipartisan support allows you to appear as though you are working together to get things done in Washington. A recent Gallup Poll indicated that 54% of Americans want political leaders to work together in Washington to get things done. [108]

In addition, this is an issue that presents an opportunity for you to appear as though you are protecting the American worker. The hydropower industry currently employees about 143,000 people. [109]If you protect or expand this industry it is clear that you care about American jobs.

The political opposition to hydropower will be concentrated within some environmental groups. However, most environmental groups are primarily concerned with the creation of a new dam. In this case since you are utilizing existing dam infrastructure, there is likely to be less significant environmental concerns. In addition, many of these existing dams have already utilized many techniques to make these facilities more environmentally friendly. In addition, since there is relatively no new construction at these facilities, it is less likely that land would have to be taken or trees cleared. Essentially, these facilities allow for the utilization of increased amounts of

[108] Frank Newport, "Americans Favor Compromise to Get Things Done in Washington," October 9, 2017, accessed November 22, 2017, http://news.gallup.com/poll/220265/americans-favor-compromise-things-done-washington.aspx

[109] U.S. Department of Energy, "Hydropower Vision: New Report Highlights Future Pathways for U.S. Hydropower," accessed October 20, 2017 https://energy.gov/articles/hydropower-vision-new-report-highlights-future-pathways-us-hydropower.

energy generated by hydropower, without the typical construction concern associated with those facilities.

As the Conowingo Dam in Maryland has demonstrated, there is actually beneficial effects that can occur from a dam trapping sediment. [110] In this case, sediment has been inhibited from entering the Chesapeake Bay. This should be pointed out to many environmental groups that existing dams are likely doing this for their bodies of water and should considered to be maintained for that reason as well as additional power generation.

There are several likely allies in this process. The hydropower industry is one group that is likely to be extremely supportive of expanded generation. Organizations that generate power like power companies are obvious allies. However, other allies include organizations that create turbines and other equipment for hydropower facilities. In addition, labor groups are likely to be supportive of efforts to construct new power generation facilities, as this would result in increased construction work and other jobs. Even strong environmental organizations like the Sierra Club say that they support, "the use of existing generating plants."[111]

Organizations that may oppose these efforts such as the Water Keepers are at times very organized. They have affiliate chapters and can lead writing campaigns, show

[110] Pamela Wood, "Hogan plans test dredging of sediment at the Conowingo Dam," The Baltimore Sun, Aug. 8, 2017, accessed November 10, 2017, http://www.baltimoresun.com/news/maryland/environment/bs-md-hogan-conowingo-20170808-story.html

[111] Nick Cain, "Clean and Green to Dark and Dirty - And What's in Between," accessed November 22, 2017, https://vault.sierraclub.org/planet/200104/energy_types.asp

up at congressional town hall meetings, call congressional offices or even stage a protest. However, in this case because there is not a new dam construction at the facility, it is much more likely that these groups would not be as active in fighting new power generation. One way that these groups could become partners in these projects is to allow a portion of the revenues from the power generation at these facilities go towards projects in the river basins that the river keepers are working on. This funding could go towards their environmental monitoring efforts, restoration efforts or compliance efforts. By allowing these organizations to become partners in these projects it is possible that they could become allies instead of having strong positions against the projects.

The cost to power all of the federal dams is not known at this time. However, it is worth noting that these projects could be revenue generators for the government if the power is sold on the open market. In this way, the costs to create these projects could be minimized to a degree through revenue generation potential.

The cost of inaction in this case for legislators can be steep. The public clearly believes climate change is occurring and is looking for action. However, these projects not only impact greenhouse gas emissions, but also offer more American energy independence. Hydropower is the most reliable clean energy source. This offers the most attractive options to lawmakers to not only utilize a clean energy source, but one that is also highly reliable. In this case, the alternative to hydropower is other forms of alternative energy that have not proven as reliable. A second alternative is not utilizing

existing facilities, but rather constructing new dams. This seems cost prohibitive and is likely to receive significant environmental push back.

VII. Recommendations

Although hydropower generators do not directly emit air pollutants, dams, reservoirs, and the operation of hydropower electric generators can affect the environment. Particularly, these dams can obstruct the natural migration of fish, change natural water temperatures, obstruct natural flows and silt loads in rivers. However, the vast majority of the federally owned dams were built mainly for flood control, municipal water supply, and irrigation water. [112] This means that these facilities are critically important for various reasons and thus not likely to be removed. Since this is the case, these facilities should be utilized for the additional benefit of generating clean, reliable power.

We should introduce and pass legislation that reduces greenhouse gas emissions by 15% through an increased utilization of hydropower by 2050. This goal will be accomplished by powering 100 non-powered federally owned dams. These 100 dams have been identified as the facilities that provide the greatest potential for power generation by the U.S. Department of Energy. These facilities can increase capacity in the short-term by 12 gigawatts or the equivalent of adding 15% capacity to the U.S.

[112] U.S. Energy Information Administration, "Hydropower generators produce clean electricity, but hydropower does affect the environment,"

hydropower output. [113] American hydropower development has stalled because of government red tape and environmental opposition.

The legislation will allow the these facilities to be permitted within one year as opposed to the typical two years that it currently takes. This will be accomplished by requiring the permitting process to be sped up and to allow these faculties to be "grandfathered in" under previous environmental regulations, even though some new construction will occur at these facilities. By allowing the permitting of these facilities to occur in a faster manner, we would generate enough electricity for nearly three million more homes and create thousands of jobs.[114] This would allow us to kick start our reduction of greenhouse gas emissions.

Stringent environmental reviews could still occur during this time period by allowing several things to occur. Instead of having multiple federal agencies involved in the permitting of these facilities, this legislation can reduce the duplicative nature of the process by allowing the FERC to be the only agency needed to issue permits at these facilities. In addition, the legislation should allow for multiple parts of the permitting process to occur at once without having to wait in a sequential order, which can significantly delay the projects.

---

[113] U.S. Department of Energy, "An Assesment of Energy Potential at Non-Powered Dams in the United States," April 2012, accessed October 20, 2017, https://energy.gov/sites/prod/files/2013/12/f5/npd_report_0.pdf

[114] Lisa Murkowski and Jay Faison, "Stop Wasting America's Hydropower Potential," *New York Times*, January 4, 2016, accessed November 22, 2017 https://www.nytimes.com/2016/01/14/opinion/stop-wasting-americas-hydropower-potential.html?_r=0

One primary concern regarding hydropower is the amount of fish kills that result from turbines. Unfortunately, many groups utilize outdated information when presenting the effects of modern turbines. It is in fact true, that older turbine technology resulted in fish kills in the range of 5 to 10 percent of the fish passing through the turbines. [115] However, research and turbine advancements funded by the U.S. Department of Energy have now produced turbines that can lower fish kills to lower than 2 percent of the fish passing through the dam. [116] This significantly mitigates that concern. However, we should take this one step further by allowing 10% of the revenue generated from these facilities to either be directed to research to improve turbine technologies further or to fund organizations such as the River Keepers that can monitor the overall health of these waterways. These funds can be used by these organizations to make improvements to the overall health of these waterways. This funding should also help to install even more technologically advanced fish ladders and elevators on these dams, which can be used to help fish move around or over dams to the spawning grounds upstream.

It is critically important that we use hydropower to meet our greenhouse gas emission reductions. Hydropower currently produces about 6 percent of the nation's electricity and nearly half of its renewable energy, more than wind and solar

[115] U.S. Department of Energy, "An Assesment of Energy Potential at Non-Powered Dams in the United States," April 2012, accessed October 20, 2017, https://energy.gov/sites/prod/files/2013/12/f5/npd_report_0.pdf
[116] Ibid.

combined.[117] This is enough electricity to power 30 million homes and, according to the Department of Energy, avoids some 200 million metric tons of carbon dioxide emissions each year.[118]

The additional benefitting of utilizing hydropower at existing facilities is that it has demonstrated strong bipartisan support. Bipartisan bills with strong support for hydropower have already passed through the House and Senate. In addition, the President has indicated support for increased hydropower production as well. Powering these 100 facilities also sends a strong message that the U.S. is committed and working toward greenhouse gas reductions even if we are no longer participating in the Paris Agreement. Currently, only 3 percent of the nation's 80,000 dams produce electricity.[119] Powering these federal facilities will have the ability to reduce our greenhouse gas emissions by 15 percent, but it can also serve as a model to potentially power other facilities such as private dams and locks which could lead to further power generation and greenhouse gas reductions.

Finally, as new powered facilities come online they have the ability to help pay for the conversation of additional facilities. The legislation should require 25 percent of revenues produced from power generation to pay for the development of additional facilities until all 100 dams are powered. This has the ability to reduce the impact this legislation has on the federal budget.

---

[117] Lisa Murkowski and Jay Faison, "Stop Wasting America's Hydropower Potential," New York Times, January 4, 2016, accessed November 22, 2017 https://www.nytimes.com/2016/01/14/opinion/stop-wasting-americas-hydropower-potential.html?_r=0

[118] Ibid.

[119] Ibid.

It is clear that action needs to occur on reducing greenhouse gas emissions. With hydropower, there is an opportunity to address climate change and "bridge the divide" between parties. The American public has demonstrated that they believe climate change is occurring. The scientific community is also in agreement that it is occurring as well. A recent Gallup poll shows that fifty-four percent of Americans want political leaders in Washington to compromise to get things done.[120] Hydropower allows us to position ourselves as the party that is promoting ideas and solutions that address this serious issue. It also provides a realistic approach that can actually reduce greenhouse gas emissions and get the support needed to move through Congress. For these reasons, it is recommended we introduce legislation that allows for the powering of 100 non-powered federal dams that have demonstrated the best ability to produce power by 2050

[120] Frank Newport, "Americans Favor Compromise to Get Things Done in Washington," October 9, 2017, accessed November 22, 2017, http://news.gallup.com/poll/220265/americans-favor-compromise-things-done-washington.aspx

Curriculum Vitae

Ryan M. Nawrocki

Baltimore, Maryland DOB July 13, 1983

PROFESSIONAL EXPERIENCE

Maryland Transit Administration, Baltimore, Maryland

Senior Director Office of Communications and Marketing, January 2016 through Present

- Manage 30-person media relations, marketing print and mail operations team.
- Oversee a multi-million-dollar marketing and media relations budget.
- Direct operations of two FM radio stations heard by over 100,000 people daily.
- Run a TV show available in over 1 million cable households and manage MTA website.
- Oversee 12 social media platforms with a combined followership of more than 70,000 people.
- Manage sales of all MTA transit advertising space, MTA corporate partnerships and sponsorships.

U.S. House of Representatives, Rep. Scott Perry, Washington, D.C.

Communications Director, January 2013 through January 2016

- Act as spokesperson for Rep. Perry with D.C and district press.
- Manage communications staff to implement effective total media plan.
- Oversee several hundred-thousand-dollar marketing budget for franked mail, social media and web.
- Implemented effective marketing and media plan that significantly increased reelection standing.

Rep. Scott Perry Campaign, Red Lion, Pennsylvania

Campaign Manager, January 2014 through January 2016

- Managed a million-dollar campaign reelection budget.
- Oversaw day-to-day operations of the campaign including paid and social media, direct mail, and telephone communications.

- The nonpartisan Cook Political Report acknowledged the campaign as one of the top 4 over performing campaigns in the country by exceeding what a Republican in the district should receive by 16%.

U.S. House of Representatives, Rep. Andy Harris, Washington, D.C.

Communications Director, January 2011 through December 2012

- Acted as Rep. Andy Harris' spokesperson for all D.C. and district media.
- Ran the entire communications program including franked mail, targeted mail and telecommunications program.
- Developed web and social media ad campaigns.

LifeBridge Health, Baltimore, Maryland

Communications Coordinator, June 2007 through December 2010

- Acted as a spokesperson for LifeBridge Health, a billion-dollar health care organization in Maryland, which includes Sinai Hospital, Northwest Hospital, Levindale Hebrew Geriatric Center and Hospital, Courtland Gardens Nursing & Rehabilitation Center, and LifeBridge Health & Fitness.
- Oversaw budget for clients in excess of $500,000.
- Coordinated internal and external corporate events, such as press conferences, physician lectures and screenings and other events.
- Managed a weekly radio show on 105.7 FM for the health care system that included scheduling guests and researching relevant, consumer friendly topics.

The Maryland Aviation Administration/BWI-Marshall Airport, BWI, Maryland

Spokesperson, Maryland Aviation Administration/BWI-Marshall Airport, August 2006 to June 2007

- Acted as spokesperson for Maryland Aviation Administration which includes BWI- Marshall Airport and Martin State Airport.
- Coordinated media events at BWI- Marshall Airport.
- Drafted press releases for the Maryland Aviation Administration.

EDUCATION and TRAINING

Johns Hopkins University, Washington, D.C.

Master of Arts in Public Management Degree Candidate

St. Mary's College of Maryland, St. Mary's City, Maryland
Bachelor of Arts with Honors in Economics, Political Science, Sociology, and Public Policy

- Honors: *Cum Laude*; Omicron Delta Epsilon, Pi Sigma Alpha, Alpha Kappa Delta

Leadership Baltimore County, Towson, Maryland

- Yearlong program focused upon developing leadership skills and knowledge of local government, nonprofits, the Baltimore area business community and the education system.

AWARDS

- Winner, Mass Transit Magazine, 40 Under 40, 2017
- Winner, Baltimore Daily Record VIP List 40 Under 40 Award, 2017
- Winner, Rising Star, Social Shakeup Conference, 2017
- Finalist, Digital Leader of the Year, PR News, 2017
- Finalist, PR Professional of the Year, PR News, 2017
- Team Leader Finalist, Crisis Communications, PR News, 2017
- Team Leader Finalist, Podcasts, PR News, 2017
- Team Leader Finalist, Media Event. PR News, 2017
- Team Leader Finalist, Best Use of Technology, American Public Transportation Association, 2017
- Team Leader Finalist, Best YouTube Video of the Year, PR News, 2017
- Best Manager of Top House Races in the Country, Cook Political Report, 2014